Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Petition To Adopt Service Rules for Unmanned Aircraft Systems ("UAS") Command and Control in the 5030-5091 MHz Band	)	RM-11798
	)	
	)	
	)	

To: The Commission

COMMENTS OF
THE BOEING COMPANY

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SUMMARY

The Boeing Company ("Boeing") strongly supports the Aerospace Industries Association's ("AIA") Petition for the Commission to develop technical and operational rules relating to the use of the 5030-5091 MHz band for Unmanned Aircraft Systems ("UAS"). Without service rules for this spectrum, UAS manufacturers, operators, and developers such as Boeing lack regulatory guidance for their UAS development efforts. The absence of service rules also increases the risk that the United States will fall behind other countries in UAS innovation and integration. The Commission should therefore act expeditiously to adopt service rules for this spectrum. Arguments by some parties that such action should be delayed are unpersuasive and internally inconsistent.

In adopting these rules for UAS operations in the 5030-5091 MHz band, the Commission should address three specific issues. First, the Commission should limit the use of the 5030-5091 MHz band to safety-of-life communications. During flight, Control and Non-Payload Communications ("CNPC") in the band will include transmission of operational information between the UAS and the individual operators—referred to as "pilots in command" ("PICs")—as well as between UAS ground stations allowing indirect relayed communications between the UAS and the PICs, and between the PICs and airspace traffic control facilities in the vicinity. Because of the significant bandwidth required for these communications, Boeing concurs with the AIA that the Commission should prohibit non-safety-of-life communications in the 5030-5091 MHz band. Boeing also agrees with the AIA petition the Commission should modify the U.S. Table of Frequency Allocations to reflect this allocation of the 5030-5091 MHz band for UAS safety-of-life transmissions.

Second, the Commission should develop a dynamic frequency-assignment process to facilitate use of the spectrum by authorized PICs. Because the demand for spectrum access is likely to surpass supply, Boeing supports the AIA's suggestion that the FCC implement a process by which PICs can request certain frequencies pre-flight and then release those frequencies for re-use by other PICs after a reasonable period of time. In order to facilitate real-time frequency assignments, the FCC should create one or more Frequency Assignment Managers who will coordinate efficient spectrum access and re-use of frequencies for multiple UAS across geographic areas.

Third, the Commission should adopt the AIA's recommendation to develop an FCC licensing framework that is aligned with FAA flight certification requirements. Such a licensing framework will ensure that PICs operate under a Commission license, while also requiring that PICs be properly qualified by the FAA to operate UAS in the national airspace. Because of the significant public safety and security risks associated with the increased operation of UAS in the nation's airspace, it is necessary that the Commission limit UAS operation to licensed PICs.

By promulgating rules that address these three key issues, the FCC will provide UAS manufacturers, developers, and operators with the regulatory guidance necessary to continue to grow the U.S. UAS industry. Boeing therefore supports the AIA's recommendation that the Commission promptly commence a rulemaking to promulgate service rules for the 5030-5091 MHz band.

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The Boeing Company ("Boeing") provides these comments in response to the Aerospace Industries Association's ("AIA") petition for rulemaking to adopt licensing and service rules for Control and Non-Payload Communications ("CNPC") links in the 5030-5091 MHz band to support Unmanned Aircraft Systems ("UAS").[1] Boeing—a member of the AIA Board of Governors—has substantial interests in this proceeding, and it strongly supports the AIA's Petition.

I. INTRODUCTION

Boeing and its subsidiaries are leaders in the field of unmanned technology innovation and integration, and they are driving the safe design and integration of autonomous systems that include perception, machine learning, and advanced flight control systems. Boeing and its subsidiaries have conducted UAS operations that have accumulated millions of flight hours.[2]

[1] Petition to Adopt Service Rules for Unmanned Aircraft Systems ("UAS") Command and Control in the 5030-5091 MHz Band, *Petition for Rulemaking*, RM-11798 (Feb. 8, 2018) ("*Petition*").

[2] *See, e.g.*, Insitu Celebrates One Million Flight Hours (2017), https://www.insitu.com/press-releases/Insitu-Celebrates-One-Million-Flight-Hours (*last visited* May 21, 2018) (Insitu is a wholly-owned subsidiary of Boeing).

These UAS can be customized with mission-specific technologies for a wide range of tasks, including search and rescue, disaster response, asset and force protection, border security, wildlife monitoring, agricultural assessment, communications relay, anti-piracy, and firefighting.

In addition to their use by civil and commercial organizations for such missions as monitoring railways and supporting oil and gas and mining operations, Boeing's UAS products are being used by the U.S. government for homeland security. The U.S. Marine Corps and the U.S. Navy have been using and deploying Boeing's UAS for more than a decade. Boeing is currently developing a twin-engine UAS for the U.S. Air Force, which is designed to operate for up to 100 consecutive hours without landing while carrying a payload of more than 1,000 pounds, which is more than triple the endurance range of currently existing intelligence, surveillance, and reconnaissance platforms.[3]

Boeing is also leading the field in UAS safety. Through its subsidiaries, Boeing has partnered with the University of Alaska Fairbanks as part of the FAA's UAS Integration Pilot Program, through which Boeing will work with state, local, and tribal governments and UAS operators and manufacturers to accelerate the safe integration of UAS into the National Airspace System ("NAS").[4] Boeing's participation in the FAA's UAS Integration Pilot Program will enable Boeing to play a key role in increasing the safety of flight within the NAS, while simultaneously demonstrating the capabilities of its UAS, including operations over urban settings, night

[3] Orion UAS Contracted by U.S. Air Force (2018), http://www.aurora.aero/wp-content/uploads/ (*last visited* May 21, 2018) (Aurora is a wholly-owned subsidiary of Boeing).

[4] Insitu and University of Alaska Fairbanks to Partner in UAS Integration Pilot Program (2018), https://www.insitu.com/press-releases/Insitu-University-of-Alaska-Fairbanks-to-PartnerUASIntegrationPilotProgram (*last visited* May 21, 2018).

operations, and beyond visual line of sight ("BVLOS") flights. In fact, in October 2015, Boeing and its subsidiaries operated the first ever FAA-sanctioned UAS BVLOS flights in the NAS.[5]

In addition to its innovations in UAS design, integration, and safety, Boeing is committed to training the next generation of leaders in the field of UAS development. Earlier this month, Boeing and its subsidiaries announced their partnership with the University of North Dakota to expand the University's UAS degree program and research efforts.[6] This partnership will provide Boeing and the University with countless opportunities for research and development, including the development of new sensors, the improvement of data collection, and the development of detect and avoid and BVLOS capabilities.

Given its substantial interests in the safe integration of UAS into the NAS, Boeing provides these comments concurring with the recommendations set forth in the AIA's Petition.

II. THE COMMISSION SHOULD PROMPTLY INITIATE A RULEMAKING TO ADOPT SERVICE RULES FOR UAS IN THE 5030-5091 MHZ BAND

To promote the continued development of UAS technology in the United States, it is imperative that the Commission act quickly to promulgate service rules for UAS operations in the 5030-5091 MHz band. At the 2012 World Radiocommunication Conference, the Commission successfully advocated for the allocation of the 5030-5091 MHz band to the aeronautical mobile (Route) Service ("AM(R)S") to support radio line-of-sight control links for UAS.[7] The

[5] Insitu Unmanned Aircraft Conducts Railway Monitoring, Historic First Flight with BNSF Railway (2015), https://www.insitu.com/press-releases/Insitu-Unmanned-Aircraft-Conducts-Railway-Monitoring-Historic-First-Flight (*last visited* May 21, 2018).

[6] Insitu and University of North Dakota Partner in Unmanned Aircraft Systems Curriculum (2018), https://www.insitu.com/press-releases/Insitu-and-UND-Partner-in-UAS-Curriculum (*last visited* May 21, 2018).

[7] *See* Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference

Commission then allocated this frequency band for UAS use in the United States on March 29, 2017.[8] In its allocation order, however, the Commission did not specify service rules. Instead, the Commission concluded that "[t]echnical and operational rules relating to altitude, weight, or other requirements will be addressed in the service rules for this band, which will be promulgated in a separate proceeding."[9] Since that time, the Commission has not initiated a rulemaking proceeding to promulgate any service rules for UAS operation in this band.

The UAS industry, however, has not waited for the Commission to act. Although Boeing and its subsidiaries have been focused on developing UAS to operate within the 5030-5091 MHz band, other entities have not. Instead, they have been conducting UAS operations involving numerous frequency bands.[10] With more UAS filling the skies today than ever before, standardization of UAS operations is crucial for public safety and security purposes. For example, according to a new study, the number of public safety agencies using drones has more than doubled since 2016.[11] As a step toward creating uniformity in UAS operations, the Commission should promulgate service rules for UAS flights in the 5030-5091 MHz band.

(Geneva, 2007) (WRC-07), Other Allocation Issues, and Related Rule Updates, ET Docket No. 12-338, ET Docket No. 15-99, and IB Docket 06-123, *Report and Order, Order and Notice of Proposed Rulemaking*, 30 FCC Rcd 4183, ¶ 225 (2015).

[8] *See* Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012) (WRC-12), Other Allocation Issues, and Related Rule Updates, ET Docket No. 15-99, *Report and Order*, FCC 17-33 (March 29, 2017).

[9] *Id.* at ¶ 42.

[10] *See Petition* at 4 n.12 and accompanying text (explaining that the Commission has granted about two dozen experimental licenses for UAS operations involving numerous frequency bands over the past two years).

[11] *See Law Enforcement Agencies Turning to Drones to Fight Crime*, The Washington Post, at 6 (May 29, 2018) (citing to study by the Bard College, New York, Center for the Study of the Drone).

The lack of service rules for UAS operations has also negatively impacted the U.S. economy and the United States' status as a leader in the field of emerging technology. Without service rules, UAS manufacturers such as Boeing have been inhibited from realizing the full potential of their UAS development and integration efforts. According to the White House Office of Science and Technology Policy, the forecasted benefits of increased UAS development and deployment in the United States include "tens of billions of dollars" in economic impact and "tens of thousands of new jobs."[12] In fact, while the lack of certainty regarding service rules in the United States has caused UAS innovation and development to slow, the regulations in other countries have allowed the UAS industry to expand. As a result, some U.S. manufacturers and developers have taken their UAS programs overseas.[13] To ensure the global leadership of the United States in UAS development and integration, the Commission should act quickly to promulgate service rules for the 5030-5091 MHz band.[14]

III. ARGUMENTS FOR DELAY IN ADOPTING SERVICE RULES FOR UAS IN THE 5030-5091 MHZ BAND ARE INCONSISTENT AND UNPERSUASIVE

A coalition of companies that are experimenting with small UAS for various commercial purposes filed comments in this proceeding arguing against the adoption of a Notice of Proposed

[12] *Integrating Unmanned Aircraft Systems into the National Airspace*, Office of Science and Technology Policy (Oct. 25, 2017), *available at* https://www.whitehouse.gov/articles/integrating-unmanned-aircraft-systems-national-airspace/ (*last visited* May 21, 2018).

[13] *See id.*

[14] *See Unmanned Aircraft Systems Integration Pilot Program*, Presidential Memorandum for the Secretary of Transportation, The White House, Sect. 1 (Oct. 25, 2017), *available at* https://www.whitehouse.gov/presidential-actions/presidential-memorandum-secretary-transportation/ (*last visited* May 21, 2018) (declaring it to be the policy of the United States to promote the safe operation of UAS and enable the development of UAS technologies for a variety of uses).

Rulemaking ("NPRM") addressing service rules for UAS in the 5030-5091 MHz band.[15] The self-described Small UAV Coalition offers in its comments that it "does not take issue with the focus on the 5030-5091 MHz band" for UAS, acknowledging that the band was allocated for this purpose both by the ITU in 2012 and by the Commission in 2017.[16] The Small UAV Coalition nevertheless questions whether the 5030-5091 MHz band is the most appropriate candidate for UAS communications given that it entails only 61 megahertz of bandwidth.[17] Boeing concurs that additional spectrum will be needed in the future for UAS operations, but, as the Coalition acknowledges, the 5030-5091 MHz band has already been allocated for UAS and it therefore should be employed for this purpose, particularly since no additional spectrum has been identified.

The Coalition mistakenly suggests that the FCC has identified "over 20 other spectrum bands allocated to UAS operators" through various experimental licenses.[18] These were not allocations, of course, but temporary assignments that were made available by the FCC's Experimental License Branch on an unprotected basis with an express condition that they do not cause harmful interference to any other licensed service. Such limitations on use are entirely inappropriate for UAS safety-of-life communications.

The Coalition further questions whether the 5030-5091 MHz band should be limited to UAS line-of-sight operations, suggesting that beyond visual line-of-sight operations may also be appropriate.[19] The Coalition then acknowledges that the Commission's 2017 order that formally

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[15] *See* Comments of the Small UAV Coalition, RM-11798 (May 29, 2018).

[16] *Id.* at 2.

[17] *See id.* at 3.

[18] *Id.*

[19] *See id.*

allocated the 5030-5091 MHz band to UAS expressly limited the use of the band to line-of-sight communications.[20] Thus, the Coalition's speculation is moot (effectively an untimely petition for reconsideration of the Commission's 2017 decision). It is for this reason that the AIA petition did not address the question of whether beyond line-of-sight communications should be permitted.

The Coalition also questions other aspects of the AIA proposal, such as whether a Frequency Assignment Manager should be employed to manage the 5030-5091 MHz band.[21] As Boeing indicates in a later section of these comments, Boeing supports the use of a Frequency Assignment Manager. In any event, the appropriate context to explore such questions and the various spectrum management approaches that are available for the 5030-5091 MHz band is in response to an NPRM through which a formal and persuasive record can be developed.

The Coalition also argues that other aspects of the AIA petition "lack clarity."[22] For example, the Coalition claims to be confused about whether the 5030-5091 MHz band would be limited to safety-of-life communications (the AIA proposal is that it would) and whether the 5030-5091 MHz band would be the only band available for UAS safety-of-life or CNPC communications (Boeing would be fine with having other frequency bands also available for such purposes, but none have been identified). The Coalition also seeks clarity on whether a Pilot in Command ("PIC") could be automated[23] (a question better left to the expertise of the FAA) and whether PICs would be required to secure a Commercial Radio Operator license from the FCC for

[20] *See id.*

[21] *See id.* at 4-5.

[22] *Id. at 5-7.*

[23] *See id.* at 6.

any UAS operation or just those that employ the 5030-5091 MHz band[24] (the AIA likely intended the latter, but this too could be resolved in a rulemaking). In any event, none of the Coalition's comments support its proposition that the issuance of an NPRM on service rules for the 5030-5091 MHz band should be delayed, and many of Coalition's questions counsel in favor of the prompt adoption by the Commission of an NPRM to address these issues.

IV. THE COMMISSION'S RULES FOR UAS CNPC OPERATIONS SHOULD RESTRICT THE USE OF UAS SPECTRUM TO SAFETY-OF-LIFE COMMUNICATIONS

Boeing and its customers in the aviation and aerospace industries depend on the availability of high integrity communications links between UAS and corresponding individual operators—referred to as "pilots in command" or "PICs"—for operational integrity, efficiency, and safety. To ensure these communication links are available during UAS flight, Boeing concurs with the AIA's recommendation that the Commission restrict the use of the UAS spectrum in the 5030-5091 MHz band to safety-of-life communications.[25]

Because the operation of CNPC links for UAS will function in spectrum allocated to the AM(R)S, communications in that band must be limited to "communications relating to safety and regularity of flight."[26] The Commission's rules therefore should prohibit the 5030-5091 MHz band from being used for payload communications or any other non-safety communications not impacting the "route" or flight of the aircraft. This limitation is particularly important in light of the fact that the need for access to the 5030-5091 MHz band for safety-of-life communications alone will greatly exceed the capacity of this spectrum.

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[24] *See id.*

[25] *See Petition* at 10–13.

[26] 47 C.F.R. § 87.5.

To ensure the safe operation of UAS, authorized CNPC must include continual streams of data between UAS and PICs during flight. These communications will include information regarding the UAS' altitude, speed, direction, GPS location, fuel reserve, and system diagnostics, as well as information regarding the atmospheric conditions surrounding the UAS, such as the weather, wind direction and speed, visibility, and obstacles or obstructions. This data may even include real-time video, which would allow PICs to see the airspace surrounding their UAS.

The ultimate goal of CNPC links is to provide as much real-time information to the PIC as possible to replicate the conditions that an actual pilot sees and experiences when sitting inside a manned aircraft. This is necessary because the PIC operates the UAS much in the same way that a pilot flies a manned aircraft, continually making small adjustments to the aircraft flaps to control pitch, lift, and height as well as to the aircraft throttle to control speed, and to the aircraft rudder to bank and turn. In order to visually identify objects above, below, or to the sides of the UAS, the PIC may also need to adjust the direction of the video camera. Thus, the transmission path between a PIC and a UAS will require a nearly constant stream of data.

In addition to communications between a UAS and a PIC, other parties will need to engage in safety-of-life communications in this spectrum. For most authorized CNPC operations between a UAS and a PIC in the 5030-5091 MHz band, there will be a direct link between the UAS and a transceiver in the PIC's possession. But there may also be communications between the UAS and other ground stations that can serve as relay points between the PIC and the UAS. As communications are linked between a PIC and a distant UAS in flight, there may also be transmissions between multiple ground stations and the UAS.

The PIC, too, may engage in authorized CNPC transmissions with aircraft control facilities in the vicinity. These communications will allow PICs to request approval from air traffic

controllers before moving UAS into controlled airspaces. These communications will also enable air traffic controllers to direct the operation of any UAS in their controlled airspace. Together, the simultaneous operation of these communications links will consume significant spectrum capacity.

The consumption of spectrum resources will be even greater where video links are utilized, as video links use substantially more bandwidth as voice or telemetry. As the AIA points out in its Petition, unless the use of video links is limited to specific phases of flight, video links could limit the already scarce CNPC bandwidth available.[27] In the event that this occurs, the number of UAS that can be operated concurrently in a geographic area will be greatly diminished. Thus, the Commission (or the UAS Frequency Assignment Manager) may want to consider limiting the use of video surveillance for the takeoff and landing portions of a UAS flight, at least in congested operating environments.

The AIA correctly observes that, because of this substantial need for access to the 5030-5091 MHz band, UAS manufacturers will likely seek to identify ways to minimize the bandwidth and power levels required by specific models of UAS in order to make it easier for PICs to identify and secure frequency authorizations for the operation of UAS in congested environments.[28] But even with these minimization incentives, the demand for spectrum resources will likely outweigh the supply. Given this need for a constant stream of data between the UAS, the PIC, and ground stations during flight to ensure the safe operation of UAS, safety-of-life communications alone will far exceed the capacity of the 5030-5091 MHz band. It is therefore imperative that the Commission adopt rules prohibiting any non-safety or payload communications in this spectrum.

[27] *See Petition* at 12.

[28] *See id.* at 12–13.

In order to reflect this use of the 5030-5091 MHz band for CNPC links to support UAS, the Commission should adjust the U.S. Table of Frequency Allocations. In particular, the Commission should modify the current prioritization rules for the 5030-5091 MHz band. International footnote 5.444 gives priority to the microwave landing system ("MLS")—which is used at some facilities for precision approach and landing—over other uses in the 5030-5091 MHz band.[29] The U.S. Table of Frequency Allocations implements this rule at footnote US444.[30] But, as the AIA notes, there are limited locations in the United States that use the 5030-5091 MHz band for MLS. Boeing therefore supports the AIA's suggestion that the Commission modify footnote US444 to identify the locations in the United States at which MLS operations are conducted and establish a mechanism for enabling UAS CNPC operations near those MLS stations.[31]

V. THE COMMISSION SHOULD ESTABLISH A FREQUENCY ASSIGNMENT MANAGEMENT SYSTEM FOR UAS FREQUENCIES

Given that the need for access to the 5030-5091 MHz band by licensed PICs will likely exceed the capacity of this spectrum, Boeing supports the AIA's proposal that the Commission establish a frequency assignment management system to assign operating frequencies to licensed PICs. In order to maximize the use of the 5030-5091 MHz band, licensed PICs should have access to radio frequencies for as little time as possible to complete UAS flights safely. PICs should also have incentives to use as little bandwidth as possible to complete each UAS flight. To achieve

[29] 47 C.F.R. § 2.106, n.5.444 ("The frequency band 5030-5150 MHz is to be used for the operation of the international standard system (microwave landing system) for precision approach and landing. In the frequency band 5030-5091 MHz, the requirements of this system shall have priority over other uses of this band.").

[30] *Id.* at n.US444.

[31] *See Petition* at 18.

these dual goals of minimizing the time spent on a given frequency and the bandwidth used during each UAS flight, the Commission should adopt the AIA's proposal for developing a dynamic frequency-assignment process and creating a UAS Frequency Assignment Manager.[32]

A dynamic frequency-assignment process would enable an authorized PIC to secure access to specific frequency channels covering a specific geographic area, and then release those channels as soon as the UAS flight in that geographic area is completed. Because of the need to coordinate these frequency assignments for multiple UAS on a real-time basis, Boeing strongly supports the AIA's proposal that the Commission create a UAS Frequency Assignment Manager. This Manager either could be operated by the U.S. Government or could be a private entity that operates under the authority of the Commission and/or the FAA. The Manager would likely be able to collect fees from authorized PICs for the assignment of frequencies and the maintenance of the database. As the AIA points out in its Petition, it may be necessary to have more than one Frequency Assignment Manager, such as a Federal Assignment Manager and a non-Federal Assignment Manager.[33] In the event that the Commission creates more than one Frequency Assignment Manager, those Managers would need to coordinate their operations using the same channel assignment database in any geographic area where their services overlap.

It is possible that the specific details of the frequency-assignment process would be best left to the direction of the Frequency Assignment Manager, but Boeing agrees with the procedures that the AIA has proposed. For example, it would make sense for authorized PICs to secure access to CNPC frequencies through a frequency assignment database on a first-come, first-served basis. These PICs should be permitted to request specific frequencies for a specific geographic location,

[32] *See id.*

[33] *See id.* at 13.

but they should only be able to do so during a brief window of time before the start of a proposed UAS flight. As the AIA anticipates, authorized PICs would initiate these requests by specifying the proposed take off time and flight duration, as well as the geographic area and/or path in which the flight will occur. It would also likely be helpful for these PICs to specify the bandwidth, power level, and waveform that will be necessary for the UAS equipment used during flight.[34]

Once these requests are made, the database should either assign specific frequency channels to the PIC, or—in the event that radio frequency channels at the specific geographic location or the requested bandwidth are unavailable—indicate that no frequency channels of the type requested are available. At times, there may be harmful interference on a frequency channel. PICs therefore should be able to request both a primary and a backup frequency channel for each flight so that they can automatically default to the backup frequency channel in the event of a disturbance. Boeing also supports the AIA's proposal that PICs be permitted to request up to two pairs of frequency assignments (a primary and a backup)—one pair for the initial stage of the flight, and a second pair for an adjacent geographic area during a later stage of the flight.[35]

Boeing further agrees with the AIA that, in order to maximize the usage of the 5030-5091 MHz band, PICs should be required to release their frequencies as soon as the flight, or the current stage of the flight, is completed. Assigned frequencies should be automatically revoked within a reasonable period of time after the UAS flight was scheduled to be completed. Thus, if a PIC does not initiate his or her flight within a certain amount of time after receiving a frequency assignment, that PIC will be required to request a new assignment.

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[34] *Id.* at 14. As the AIA points out, this kind of information will likely already have been pre-registered in the database by the UAS CNPC licensee as part of the initial registration process. *See id*.

[35] *See id.*

Boeing recognizes that the variables involved in the frequency-assignment process necessitate that the Frequency Assignment Manager's duties will be dynamic and will likely need to be modified as UAS operations develop and advance. It is also likely that the Manager will need to address diverse UAS bandwidth requirements and flight durations, depending on the kind of flight that an authorized PIC is undertaking. Because of these uncertainties, Boeing concurs with the AIA's recommendation that the Commission should not specify the details of the frequency-assignment process in its rules. Instead, the Commission should establish and designate one or more Frequency Assignment Managers, who can then develop and update the procedures for the frequency-assignment process as necessary, potentially through an advisory committee.

VI. THE COMMISSION'S RULES SHOULD REQUIRE INDIVIDUAL LICENSING FOR UAS OPERATORS

Because of the safety and security issues associated with the operation of UAS—such as the risks to manned aircrafts and to individuals in elevated work environments—Boeing supports the AIA's recommendation that the Commission adopt a licensing framework that ensures that individual operators of CNPC links in the 5030-5091 MHz band be properly qualified.[36]

PICs will be responsible for the control of UAS and any radio communications with those UAS for command and control purposes. As such, PICs should be required to demonstrate certain qualifications, including substantial knowledge about UAS operations and the mandatory regulatory procedures for the operation of those UAS. Because of the FAA's expertise in this area, Boeing agrees with the AIA that it would be appropriate for the FCC to defer to the FAA in establishing the necessary qualifications for PICs. Boeing also agrees that PICs should be required

[36] *Id.* at 8–10.

to obtain a license under Element 3 of the FCC's Commercial Radio Operator Program to ensure they have knowledge of general radiotelephone electronic fundamentals and techniques.[37]

VII. CONCLUSION

Given Boeing's heavy involvement in the safe integration of UAS into the NAS, it strongly supports the AIA's Petition for the Commission to initiate a rulemaking regarding the topics discussed herein. In promulgating its rules, the Commission should limit the use of the UAS allocation in the 5030-5091 MHz band to safety-of-life communications, and it should modify the U.S. Table of Frequency Allocations for this purpose. To maximize the number of simultaneous UAS flights that can occur, while minimizing the risks UAS pose to the public and one another, the Commission should establish a frequency assignment management system and create a Frequency Assignment Manager. The Commission should also work with the FAA to promulgate rules requiring individual licensing of UAS operators to effectively address the public safety and security issues that will arise with the increased operation of UAS in the NAS.

Respectfully submitted,

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[37] *See id.* at 9.